

February 16, 2005

Mr. Andrew Cook
Nuclear Reactor Program
Department of Nuclear Engineering
North Carolina State University
P. O. Box 7909
Raleigh, NC 27695-7909

SUBJECT: NRC INSPECTION REPORT NO. 50-297/2004-201

Dear Mr. Cook:

This letter refers to the inspection conducted on October 25-29, 2004, at your PULSTAR research reactor facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress.

Based on the results of this inspection, no safety concern or noncompliance to NRC requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>. If you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at 610-337-5373.

Sincerely,

/RA/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-297
License No. R-120

Enclosure: NRC Inspection Report No. 50-297/2004-201

cc w/enclosure: Please see next page

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North Carolina State University

Docket No. 50-297

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-297
License No: R-120
Report No: 50-297/2004-201
Licensee: North Carolina State University
Facility: PULSTAR reactor
Location: Raleigh, North Carolina
Dates: October 25 - 29, 2004
Inspector: Thomas F. Dragoun
Approved by: Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program (RNRP)
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

North Carolina State University
Report No:50-297/2004-201

The focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II non-power research reactor operation including: organization and staffing; logs and records; requalification training; surveillance and limiting conditions for operation; health physics; committees, audits, and reviews; and emergency preparedness.

Organization and Staffing

- The licensee's organization and staffing were in compliance with the requirements specified in Technical Specification Section 6.

Logs and Records

- Within the scope of this review, the licensee's record keeping program conformed to Technical Specification requirements.

Requalification Training

- Operator requalification was conducted as required by the Requalification Program.

Surveillance and Limiting Conditions for Operation

- The conduct of surveillances satisfied the requirements in Technical Specification Section 4.0.

Health Physics

- The Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

Committees, Audits, and Reviews

- The Radiation Safety Committee and Reactor Safety and Audit Committee provided the oversight required by the Technical Specifications.

Emergency Planning

- The fuel handling program satisfied licensee Technical Specification and procedural requirements.

REPORT DETAILS

Summary of Plant Status

The licensee's one megawatt open pool PULSTAR reactor operates in support of neutron activation analysis, isotope production, and undergraduate instruction. Pulsed operation ended in 1989. During the inspection, the reactor was operated on several occasions and tours of the facility were conducted for first responder fire fighters in accordance with the emergency plan. The inspector observed a reactor start up.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001)

To ensure that the requirements of Technical Specification (TS) Section 6.1, "Organization" Amendment No. 11, dated April 30, 1997, were being met. The inspector reviewed the following:

- C organizational structure
- C management responsibilities
- C staffing requirements for safe operation of the research reactor facility

b. Observations and Findings

The Associate Director was newly appointed since the last inspection and became the designated licensee of record. The new Associate Director worked at another research reactor for many years and his training and experience satisfied the requirements specified in the TS. The licensee adopted ANSI-15.1-1990 experience and training requirements for the reactor staff and incorporated the provisions in the TS. Discussions with other reactor staff indicated that they also met the requirements.

The minimum staffing when the reactor is not secured was specified in TS 6.1.2. The names of the personnel filling these positions were identified in the console log. The inspector reviewed the console records for the period April 29 to September 8, 2004, and determined that staffing requirements were met.

A review of the NRC issued reactor operator licenses showed that all were current.

c. Conclusions

The licensee's organization and staffing were in compliance with the requirements specified in the TS Section 6.

2. Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following selected maintenance and reactor operations records to ensure that the requirements of TS Sections 6.8 "Retention of Records" were being met:

- C Maintenance Log and History Reports items:
 - 00719, "Log and linear monitor" dated August 23, 2003
 - 00725, "Source Range Monitor" dated May 17, 2004, and
 - 00727, "Safety Monitor" dated September 22, 2004
- C Reactor console log from April 29 to September 8, 2004

b. Observations and Findings

Equipment maintenance records contain detailed information regarding equipment failures, the failure mode, repairs, calibrations, and operational testing prior to return to service. This data allowed the staff to predict equipment breakdowns and perform pre-emptive maintenance. Repairs were accomplished expeditiously by reactor operators so that high maintenance required by older equipment did not adversely impact the operations schedule.

Data recorded in the console log indicated that the reactor was operated within the envelope of safety parameters established in the reactor license and TS.

c. Conclusions

Within the scope of this review, the licensee's record keeping program conformed to TS requirements.

3. Requalification Training

a. Inspection Scope (IP 69001)

The inspector reviewed the following to determine if the requalification training program was conducted in accordance with Special Procedure 2.6, "PULSTAR Operator Requalification Program" Revision 6, dated January 19, 1995, and 10 CFR 50.55 "Operators' Licenses":

- the Requalification Program
- operator licenses
- operator training records for classes held on August 25, July 20, 2004, and December 4, November 23, November 10, October 30, October 8, September 16, and August 22, 2003
- operator physical examination records
- operator oral and written examination records
- watchstanding proficiency evaluation

b. Observations and Findings

The progress of each reactor operator in the requalification program was maintained in a checklist called the "OJT Log." Records showed that the physical exams, annual evaluations, biennial written exams, and reactivity manipulations were up to date as required by the requalification program. Lectures are given approximately monthly with subject matter, technical content, and attendance found to be satisfactory. Records also showed that abnormal operating procedures, Emergency Plan procedures, and the Operations Manual were reviewed as required.

c. Conclusions

Operator requalification was conducted as required by the Requalification Program.

4. Surveillance

a. Inspection Scope (IP 69001)

The inspector reviewed the following to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0:

- Procedure PS-4-07-1:B1, "Fuel Inspection" Revision 2, dated October 1, 1990. Data for October 1, 2004 and March 3, 2003
- Procedure PS-4-03-2:A1, "Regulating Control Rod Calibration" Revision 2, dated July 9, 1993. Data for August 17, 2004, August 26, 2003, and August 26, 2002
- Procedure PS-4-03-1:A1, "Regulating Control Rod Drop Time Test" Revision 2, dated July 9, 1993. Data for May 24, 2004, May 27, 2003, May 31, 2002
- Procedure PS-4-02-2:A1, "Safety No. 2 Control Rod Calibration" Revision 2, dated July 9, 1993. Data for August 17, 2004 and August 26, 2003
- Procedure PS-4-02-1:A1, "Safety No. 2 Control Rod Drop Time Test" Revision 2, dated July 9, 1993. Data for May 24, 2004, and May 27, 2003
- Procedure PS-4-01-2:A1, "Safety No. 1 Control Rod Calibration" Revision 2, dated July 9, 1993. Data for August 17, 2004 and August 26, 2003
- Procedure PS-04-01-1:A1, "Safety No. 1 Control Rod Drop Time Test" Revision 2, dated July 9, 1993. Data for May 24, 2004 and May 27, 2003

b. Observations and Findings

Surveillances were completed on schedule and in accordance with licensee procedures. The protocols and techniques were effective in verifying the performance of the safety equipment. All the recorded results were within the TS and procedurally prescribed parameters. The records and logs were complete and were being maintained as required. Checks and calibrations were completed as required by TS.

All the recorded results were within the TS and procedurally prescribed parameters. The records and logs reviewed were complete and were being maintained as required.

c. Conclusions

The conduct of surveillances satisfied the requirements in TS Section 4.0.

5. Health Physics

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 20 "Standards for Protection Against Radiation" and licensee administrative requirements:

- C Procedure HP-1, "Radiation Protection Program" Revision 5, dated July 1, 2004
- C Procedure HP-2, "Use of Irradiation Facilities" Revision 2, dated January 1, 2000
- C Procedure HP-3, "Radiological Surveys" Revision 1, dated July 1, 2004
Records of monthly radiation level and weekly smear results for January to October 2004
- Procedure HP-6, "Transport of Radioactive and Hazardous Material" Revision 1, dated September 25, 2003
- Procedure HP-7, "Leak Testing, Inventory, and Accountability of Special Nuclear Material and Licensed Sealed Sources" Revision 1, dated April 12, 2001
- Procedure HP-8, "Radiation Work Permit" Revision 2, dated June 8, 2004
- Procedure HP-9, "Respirator Use and Bioassay" Revision 2, dated February 4, 2000
- Procedure HP-10, "Calibration, Operation, and Maintenance of Radiation Survey and Chemistry Instruments" Revision 4, dated July 1, 2004
- Procedure PS 6-02-3:A1, "Vamp Area Radiation Monitor Calibration" Revision 0, dated October 26, 1994
- Procedure PS 6-05-1:W1, "Stack Particulate Filter Paper Maintenance" no revision, dated March 1, 1996
- Procedure PS 6-06-4A, "Stack Gas Radiation Monitor Sensitivity Verification" Revision 1, dated May 1, 1994
- Procedure PS 6-16-1, "Assessment of Airborne Effluents" Revision 0, dated March 2, 1998
- Procedure PS 6-17-3, "Radiation Monitoring System Set Point Verification" Revision 0, dated April 7, 2000. Weekly data for the period November 26, 2003 to May 25, 2004
- Annual Report dated August 27, 2004

The inspector toured the reactor facility to observe the use of dosimetry and radiation monitoring equipment. Licensee personnel were interviewed and radiological signs and postings were observed as well. The inspector also visited the campus survey meter calibration facility, the respirator maintenance facility, and the storage-for-decay facility.

b. Observations and Findings

The radiation protection program documentation and implementation was concise, complete, and technically sound and satisfied the requirements in 10 CFR 20.1101. The annual personnel radiation dosimetry reports for the 4 year period 2001-2004 reported doses that were below the regulatory limits. The level of controls were appropriate for the radiological hazards in the facility.

The radionuclide concentrations of the contents in the liquid waste storage tank were analyzed by the RSO. He operates the discharge system if the effluent limits stated in procedure HP-1 are satisfied. In calendar year 2004 there were 3 discharges of approximately 3,000 liters each. The licensee adopted the more restrictive EPA limit of 4 mrem per year for waterborne pathways for liquid releases in lieu of the NRC 50 mrem limit. The alarm set point for gaseous discharges through the elevated stack is verified weekly. Calculations using the EPA- COMPLY computer program indicate that the dose from gaseous effluents was less than the constraint value of 10 mrem per year.

The campus radiation protection office has established a Respiratory Protection Program applicable to the entire campus that included the reactor facility. A campus planned special exposure program was also available for use at the reactor facility. The inspector verified that these programs met regulatory requirements.

c. Conclusions

The inspector determined that: 1) surveys were being completed and documented acceptably to permit evaluation of the radiation hazards that might exist; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within NRC's regulatory limits; and, 4) radiation monitoring equipment was being maintained and calibrated as required, the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

6. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2 were being completed:

- Reactor Safety and Audit Committee (RSAC) membership
- RSAC minutes of meetings held September 13, June 17, and March 17, 2004, November 24, July 17, and March 6, 2003, and December 4, 2002
- Radiation Safety Committee (RSC) membership
- RSC minutes of meetings held September 15, June 21, and May 4, 2004, November 25 and May 13, 2003

b. Observations and Findings

The composition of the RSC and RSAC were as specified in the TS. A review of records indicated that both committees provided the oversight and reviews of the reactor programs as required by the TS.

c. Conclusions

The Radiation Safety Committee and Reactor Safety and Audit Committee provided the oversight required by the Technical Specifications.

7. Emergency Planning

a. Inspection Scope (IP 69001)

The inspector reviewed the implementation of selected portions of the Emergency Plan Revision 7 dated April 2, 2001 including:

- Emergency Procedure 1, "Emergency Plan Activation, Response, and Actions" Revision 13, dated May 19, 2004
- Emergency Procedure 2, "Off-site Notification" Revision 8, undated
- Emergency Procedure 3, "Release of Information" Revision 3, dated October 15, 1995
- Emergency Procedure 4, "Emergency Classification" Revision 4, dated December 15, 1997
- Emergency Procedure 5, "Recovery" Revision 3, dated October 15, 1995
- Scenarios and lessons learned from the conduct of the required annual drills held on December 20, 2002 and December 18, 2003
- Inventory verification of the two locked emergency supplies cabinets

b. Observations and Findings

The Emergency Plan (E-Plan) was revised in April 2001 under the provisions in 10 CFR 50.54(q) which requires notification of the NRC but does not require NRC approval prior to implementation of the changes. Implementing procedures were reviewed and found to be consistent with the E-Plan. Facilities, supplies, instrumentation and equipment were being maintained, controlled and inventoried as required in the E-Plan. Agreements with outside response organizations were updated and maintained as necessary. Communications capabilities were acceptable with these support groups and had been tested as stipulated in the E-Plan. Emergency drills had been conducted as required by the E-Plan. Documented critiques were held and the strengths and weaknesses identified during the exercise were used to improve the effectiveness of the program. Emergency preparedness and response training provided to fire fighters by the RSO during this inspection was determined to be effective based on the questions raised by the fire fighters.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan.

8. Exit Interview

The inspection scope and results were summarized on October 29, 2004, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

Larry Broussard, Chief Reactor Operator
Andrew Cook, Associate Director, Nuclear Reactor Program, and Reactor Operations Manager
Aymen Hawari, Director, Nuclear Reactor Program
Kerry Kincaid, Chief of Reactor Maintenance
Gerry Wicks, Reactor Health Physicist

INSPECTION PROCEDURES

IP 69001 Class II Non-power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
IFI	Inspector Follow-up Item
IP	Inspection Procedure
NRC	Nuclear Regulatory Commission
RSAC	Reactor Safety and Audit Committee
RSC	Radiation Safety Committee
RSO	Radiation Safety Officer
TS	Technical Specification